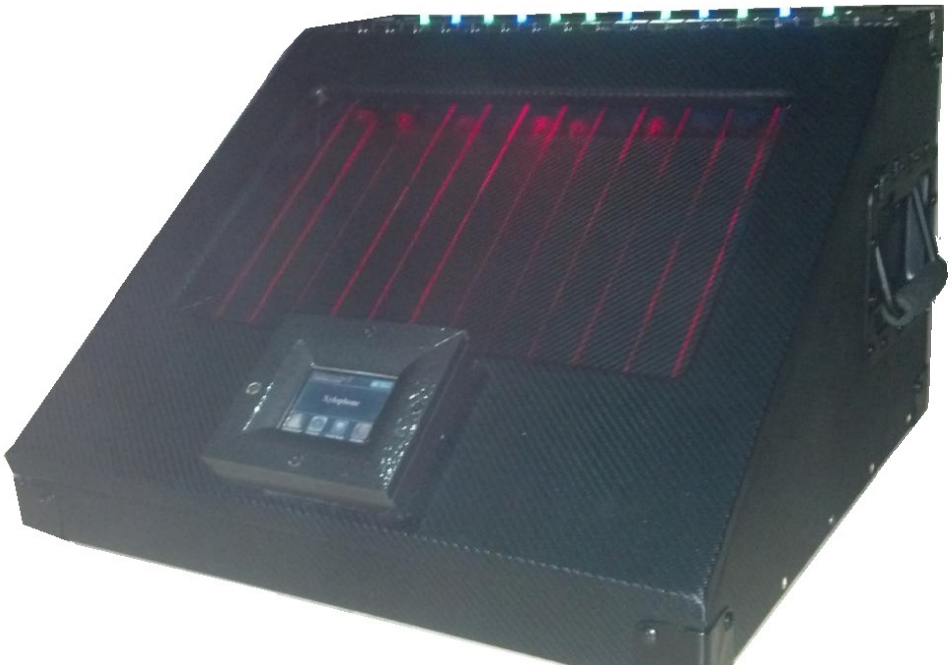
LUXAPHONE
LASER MIDI Controller



EE494 Senior Design – Spring 2013

OWNER'S MANUAL

Engineered and Built by:
Michael Wheeler
Jordan Dupree
Jim Crosslin

Important Safety Information

- This symbol warns the user of dangerous voltage levels localized within the enclosure of the unit.

- This symbol advises the user to read all accompanying literature for safe operation of the unit.

- This symbol warns the user that laser sources are present.

- Read, retain, and follow all instructions. Heed all warnings.
- Only connect the electric line cord to an earth grounded AC receptacle in accordance with the voltage and frequency ratings listed under INPUT POWER on the side panel of this product.
- **WARNING:** To prevent damage, fire, or shock hazard, do not expose this unit to rain or moisture.
- Unplug the AC power line cord before cleaning the unit exterior (use a damp cloth only). Wait until the unit is completely dry before reconnecting it to power.
- Maintain at least six inches of unobstructed air space behind the unit to allow for proper ventilation and cooling of the unit.
- This product should be located away from heat sources such as radiators, heat registers, or other products that produce heat.
- This product may be equipped with a polarized plug (one blade wider than the other). This is a safety feature. If you are unable to insert the plug into the outlet, contact an electrician to replace your obsolete outlet. DO NOT DEFEAT THE PURPOSE OF THIS SAFETY PLUG.
- Protect the power cord from being pinched or abraded.
- This product should be serviced by qualified service personnel when: the power supply cord or the plug has been damaged; or objects have fallen, or liquid has been spilled onto the product; or the product has been exposed to rain; or the product does not appear to operate normally or exhibits a marked change in performance; or the product has been dropped, or the enclosure is damaged.
- The power supply cord of this product should be unplugged from the outlet when left unused for a long period of time, or during electrical storms.
- Do not drip or splash liquids, nor place liquid-filled containers on the unit.
- **CAUTION:** No user serviceable parts inside, refer servicing to qualified personnel only.
- The amplifier system and loudspeaker employed in this product are capable of producing very high sound pressure levels which may cause temporary or permanent hearing damage. Use care when setting and adjusting volume levels during use.

FCC COMPLIANCE NOTICE

This product **HAS NOT BEEN TESTED NOR FOUND TO COMPLY** with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide a reasonable protection against harmful interference in a residential installation. This product generates, uses, and can radiate radio frequency energy and if not used in accordance with the instructions, may cause harmful interference to radio communications and there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of more of the following measure: reorient or relocate the receiving antenna, increase the separation between the equipment and receiver, connect the equipment into an outlet on a circuit different from that of the receiver. Consult an experienced radio/TV technician if help is needed.

Introduction

The Luxaphone is a fully interactive digital electronic instrument that contains 128 digital MIDI sound effects and instruments ready for you to explore and experiment with! Best of all, there is no additional equipment to lug around; everything is contained in one easy-to-carry package.

Interacting with the Luxaphone is easy. The resistive touchscreen allows you to select one of 128 possible instruments, set the volume level, vary the pitch bank, and define the root note of any pitch bank. The diverse library includes a host of instruments, such as stringed, woodwind, percussion, complete orchestral sections, and experimental sound effects.

The enclosure is outfitted with a series of 12 Red/Green/Blue Light Emitting Diodes (RGB LEDs) to indicate the natural notes, sharp notes, and the played notes. The RGB LEDs turn GREEN to indicate natural notes, BLUE to indicate sharp notes, and RED to indicate when and where a laser beam was interrupted.

This Owner's Manual is provided to the customer in digital and hardcopy form.

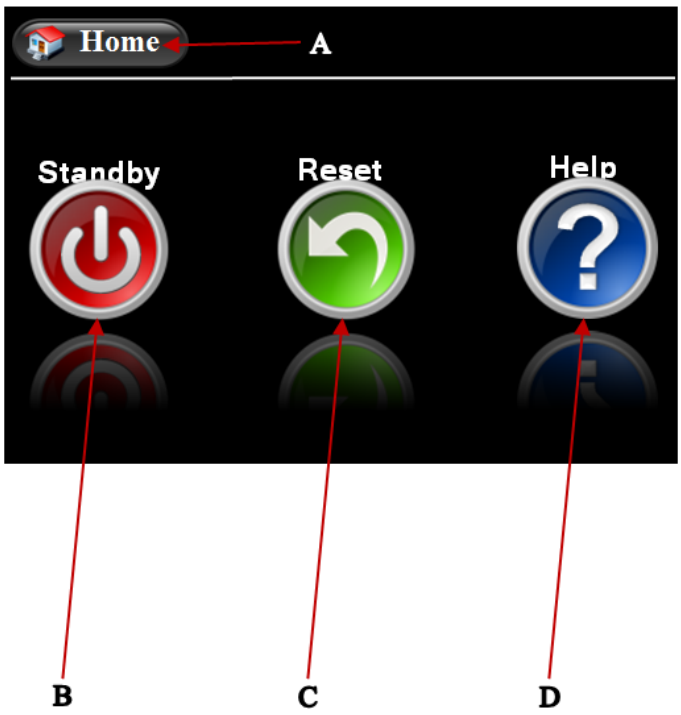
Features

The Luxaphone contains the following features:

- 15W Audio Amplifier,
- Texas Instruments Digital Signal Processor (DSP),
- 8" loudspeaker,
- Inactivity Timer (interrupts power to the lasers if the Luxaphone has been idle too long),
- Safety Interlock momentary switch (interrupts power to the lasers if the enclosure is opened),
- 2.8" Resistive Touchscreen,
- 128 MIDI Instruments and Sound Effects,
- 10 Octave Banks,
- 12 Laser Beams; One Beam for Each Note Within the Octave (A, $A^{\#}$, B, C, $C^{\#}$, D, $D^{\#}$, E, F, $F^{\#}$, G, $G^{\#}$),
- 12 Red/Green/Blue Light Emitting Diodes (RGB LED) to indicate Natural Notes, Sharp Notes, and Played Notes.

Touchscreen Overview

A. MENU – Press here to go to the Main Menu.
B. SWIPE-TO-SELECT AREA – After selecting any of the options below, swipe your finger here to make a change.
C. INSTRUMENT – Press here to access Luxaphone's extensive MIDI library.
D. VOLUME – Press here to access the volume control.
E. ROOT NOTE – Press here to tell the Luxaphone what note to assign to the first laser.
F. OCTAVE – Press here to tell the Luxaphone which octave bank to initialize to.

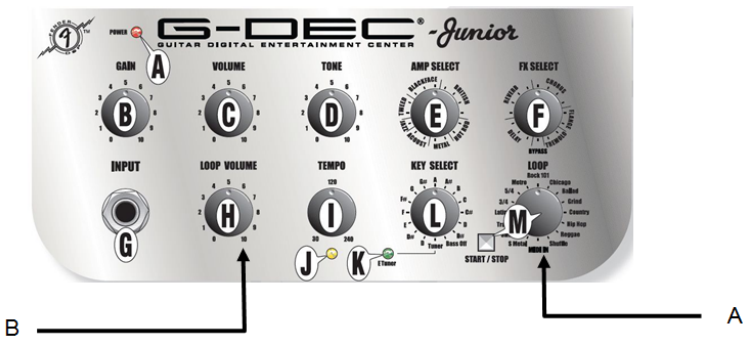


A. HOME – Press here to go to the Luxaphone's Home Screen.
B. STANDBY – Press here to force the Luxaphone into hibernation.
C. RESET – Press here to force the Luxaphone into its default state.
D. HELP – Press here to access Luxaphone's help library.
E. WAKE – When Luxaphone's Inactivity Timer expires, the lasers and RGB LEDs shut down and this screen appears. Press here to wake the Luxaphone.

Setup Instructions

To ensure proper operation of the Luxaphone, the following steps **MUST BE** performed. For electrical safety reasons, the following order is recommended:

- Ensure that the Luxaphone Laser MIDI Controller is switched off and unplugged from the power outlet,
- Unlock the Luxaphone's playing surface and open the unit,
- Prop open the lid with the lid support mechanism,
- Ensure that the amplifier system within the Luxaphone MIDI Controller is set for MIDI IN. See (A) in the following figure,
- Ensure that the LOOP VOLUME of the amplifier system within the Luxaphone MIDI Controller is set to its highest setting. See (B) in the following figure,
- Close the Luxaphone Laser MIDI Controller and lock the playing surface,
- Plug the Luxaphone Laser MIDI Controller into a standard 120V/60Hz outlet with the supplied EIC-style plug and cord,
- Switch the power ON,
- After the Luxaphone has booted, you are ready to begin playing! See "TOUCHSCREEN OVERVIEW" for information on making changes to the program.



APPENDIX A: TROUBLESHOOTING

The following troubleshooting table is presented in decreasing order of likely *Possible Causes* for a particular *Problem*. If after running through this troubleshooting guide the Luxaphone still does not behave as expected, refer to the Luxaphone Service Manual for more information.

Problem	*Possible Causes*	*Solution*
Instrument does not turn on	Instrument not plugged into the wall.	Plug instrument into a 120V/60Hz wall outlet.
Lasers do not turn on	Instrument is not turned on.	Plug instrument into a 120V/60Hz wall outlet and turn the instrument on.
	Inactivity Timer has expired.	Press the "wake" button on the touchscreen.
	Lid is open.	Close and lock the lid, press the "wake" button on the touchscreen.
Instrument does not make any sounds	Instrument is not turned on.	Plug instrument into a 120V/60Hz wall outlet and turn the instrument on.
	Inactivity Timer has expired.	Press the "wake" button on the touchscreen.
	Lid is open.	Close and lock the lid, press the "wake" button on the touchscreen.
	Volume is turned all the way down.	Verify the volume setting on the touchscreen by pressing the VOLUME button.
	Amplifier volume is turned all the way down.	Open the lid and verify that the LOOP VOLUME knob is turned all the way up.
	The Amplifier is not set to process MIDI messages.	Open the lid and verify that the LOOP knob is set to MIDI IN
Instrument is producing unexpected or incorrect sounds	Instrument selected is different than what you wanted.	Select the desired instrument from the MIDI library by using the INSTRUMENT option on the touchscreen.
	The KEY SELECT knob is set to TUNER.	Open the lid and verify that the KEY SELECT knob is not set to the TUNER position.

APPENDIX B: MIDI PROGRAM NUMBERS

Program Change	General MIDI Instrument
1	(Grand) Piano 1
2	(Bright) Piano 2
3	(Electric Grand) Piano 3
4	Honky-Tonk Piano
5	Electric Piano 1
6	Electric Piano 2
7	Harpsichord
8	Clavi
9	Celesta
10	Glockenspiel
11	Music Box
12	Vibraphone
13	Marimba
14	Xylophone
15	Tubular Bells
16	Santur
17	Drawbar Organ
18	Percussive Organ
19	Rock Organ
20	Church Organ
21	Reed Organ
22	Accordion (French)
23	Harmonica
24	Tango Accordion
25	Acoustic Guitar (Nylon)
26	Acoustic Guitar (Steel)
27	Electric Guitar (Jazz)
28	Electric Guitar (Clean)
29	Electric Guitar (Muted)
30	Overdriven Guitar
31	Distortion Guitar
32	Guitar Harmonics
33	Acoustic Bass
34	Finger Bass
35	Picked Bass
36	Fretless Bass
37	Slap Bass 1
38	Slap Bass 2
39	Synth Bass 1
40	Synth Bass 2
41	Violin
42	Viola
43	Cello
44	Contrabass
45	Tremolo Strings
46	Pizzicato Strings
47	Orchestral Harp
48	Timpani
49	String Ensemble 1
50	String Ensemble 2
51	Synth Strings 1
52	Synth Strings 2
53	Choir Aahs
54	Voice Oohs
55	Synth Voice
56	Orchestra Hit
57	Trumpet
58	Trombone
59	Tuba
60	Muted Trumpet
61	French Horn
62	Brass Section
63	Synth Brass 1
64	Synth Brass 2
65	Soprano Sax
66	Alto Sax
67	Tenor Sax
68	Baritone Sax
69	Oboe
70	English Horn
71	Bassoon
72	Clarinet
73	Piccolo
74	Flute
75	Recorder
76	Pan Flute
77	Blown Bottle
78	Shakuhachi
79	Whistle
80	Ocarina
81	Lead 1 (Square)
82	Lead 2 (Sawtooth)
83	Lead 3 (Calliope)
84	Lead 4 (Chiff)
85	Lead 5 (Charang)
86	Lead 6 (Voice)
87	Lead 7 (Fifths)
88	Lead 8 (Bass + Lead)
89	Pad 1 (Fantasia)
90	Pad 2 (Warm
91	Pad 3 (Polysynth)
92	Pad 4 (Choir)
93	Pad 5 (Bowed)
94	Pad 6 (Metallic)
95	Pad 7 (Halo)
96	Pad 8 (Sweep)
97	FX 1 (Rain)
98	FX 2 (Soundtrack)
99	FX 3 (Crystal)
100	FX 4 (Atmosphere)
101	FX 5 (Brightness)
102	FX 6 (Goblins)
103	FX 7 (Echoes)
104	FX 8 (Sci-Fi)
105	Sitar
106	Banjo
107	Shamisen
108	Koto
109	Kalimba
110	Bap Pipe
111	Fiddle
112	Shanai
113	Tinkle Bell
114	Agogo
115	Steel Drums
116	Woodblock
117	Taiko Drum
118	Melodic Tom
119	Synth Drum
120	Reverse Cymbal
121	Guitar Fret Noise
122	Breath Noise
123	Seashore
124	Bird Tweet
125	Telephone Ring
126	Helicopter
127	Applause
128	Gunshot

NOTE: The MIDI Program Number in the digital domain begins at 0 and ends at 127 for a total of 128 instruments and is typically numbered in Hexadecimal format.